R E P O R T R E S U M E S

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TRAINING NUCLEAR TECHNICIANS.

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DESCRIPTORS- *JUNIOR COLLEGES, *TECHNICAL EDUCATION, PROGRAM PLANNING, PROGRAM DESCRIPTIONS, ENGINEERING TECHNICIANS, NUCLEAR PHYSICS, ELECTRONICS, ELECTRONIC TECHNICIANS, OLD DOMINION COLLEGE,

PROBLEMS CONFRONTED BY PLANNERS OF NUCLEAR PROGRAMS AT THE TECHNICIAN LEVEL INCLUDE (1) LACK OF PRECEDENT IN CURRICULUM, COURSE OUTLINES, AND GRADUATE PLACEMENT, (2) DIFFICULTY IN DETERMINING COSTS OF LABORATORY CONSTRUCTION, EQUIPMENT, AND OPERATION, AND (3) REQUIREMENT OF ATOMIC ENERGY COMMISSION LICENSES IN NUCLEAR OCCUPATIONS. A 92-SEMESTER UNIT PROGRAM DEVELOPED AT THE COMMUNITY COLLEGE DIVISION OF OLD DOMINION COLLEGE COMBINES NUCLEAR COURSES WITH A STRONG BASE IN ELECTRONICS. THE PROGRAM, WHICH IS OPEN ONLY TO HIGH SCHOOL GRADUATES WHO HAVE COMPLETED ELEMENTARY AND INTERMEDIATE ALGEBRA, PLANE GEOMETRY, AND CHEMISTRY, INCLUDES ENGLISH AND TECHNICAL WRITING, SOCIAL STUDIES, MATHEMATICS, PHYSICS, ELECTRICITY AND ELECTRONICS, NUCLEAR STUDIES, OTHER TECHNICAL COURSES, AND PHYSICAL EDUCATION. LISTS OF MAJOR EQUIPMENT AND A PROGRAM OUTLINE ARE PROVIDED IN THE ARTICLE. THIS ARTICLE IS PUBLISHED IN "SCHOOL SHOP," VOLUME 26, NUMBER 7, MARCH 1967. (WO)

Proof of this program's effectiveness is its graduate-placement record

Training Nuclear Technicians

By Edgar A. Kovner

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Old Dominion nuclear-technology trainee prepares a radioactive sample protected by laboratory's special fume-control installation. Note use of plastic gloves to avoid contamination.

THE introduction of a nuclear program at the engineering-technology level is a project not to be undertaken too lightly. There is very little precedent available as a guide in the area of curricular content, course outlines, and graduate placement. Expense of laboratory construction, equipment, and operation is difficult to ascertain. Then there arises the further requirement of Atomic Energy Commission licenses in the various nuclear operations.

Nevertheless, that these problems have been effectively surmounted is attested to by the following record of success achieved by the Community College Division of Old Dominion College in its nuclear-option program in electronic-engineering technology directed by J. Hirst Lederle:

April 27, 1962: Circulated letter to industry describing proposed curriculum and soliciting comments.

July 25, 1962: Submitted initial proposal for AEC grant.

May 20, 1963: Received $10,000 grant.

July 2, 1963: Requested Special Nuclear Material License from AEC.

July 30, 1963: Received Special Nuclear Material License.

September 18, 1963: Accepted first students in new Nuclear Option. In addition, several second-year students transferred to the new program.

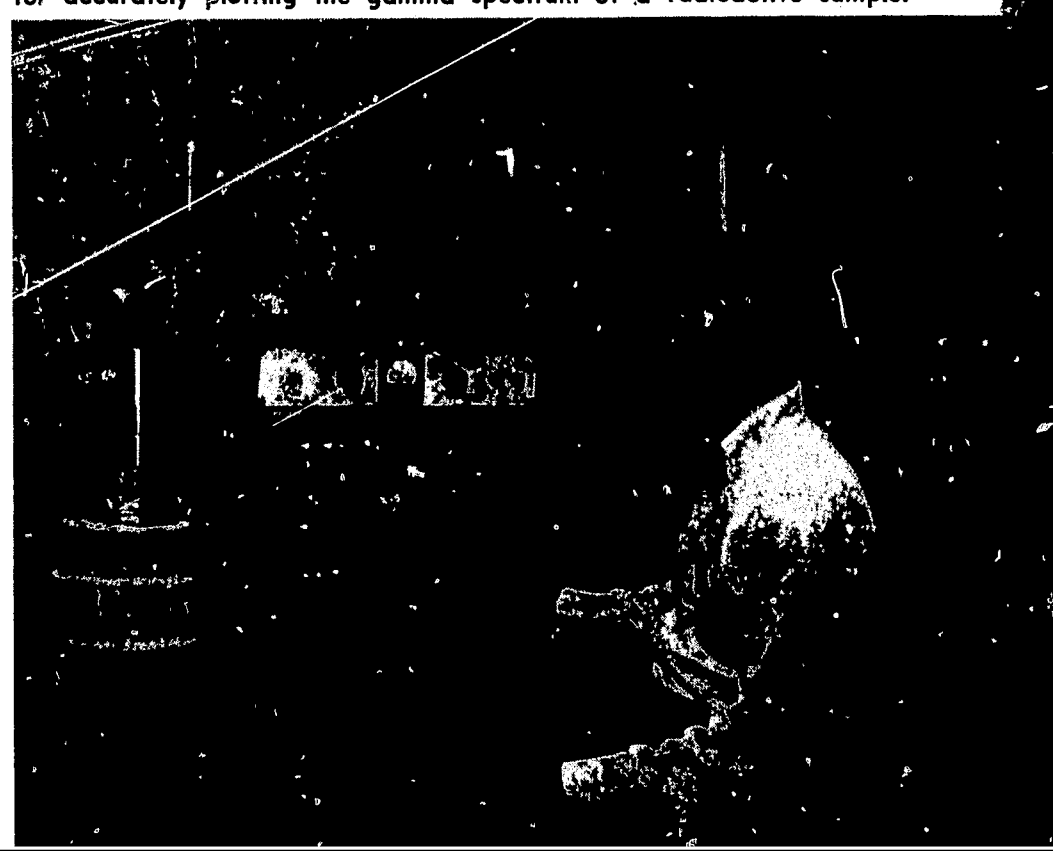
February 1, 1964: Applied for Byproduct Material License from AEC.

February 28, 1964: Received Byproduct Material License.

August 12, 1964: Graduated initial class.

Supervised by an instructor, students here remove a sample from the neutron howitzer with the neutron source in the safe-storage position. Simultaneously, survey meter is monitoring for excessive neutron leakage.

Pursuing a procedure used extensively in industry, this student is operating a 400-channel analyzer with scintillation detectors to obtain data for accurately plotting the gamma spectrum of a radioactive sample.



As for the professional acceptance accorded our graduates, consider this partial listing of their present whereabouts:

• Five are employed in the Submarine Reactor Plant Department, Atomic Power Division, Newport News Shipbuilding and Dry Dock Company, Virginia's largest industry.

• At the Virginia Associated Research Center, the operator of the 600-mev synchro-cyclotron (and author of its operating manual) is one of our graduates. Two others (including one serving as a full-fledged reactor operator) are with the Sandia Corporation, Albuquerque, N.M., still another is with the Goddard Project, Greenbelt, Md.

• A 1966 graduate is an associate engineer in the Reactor Systems Department of the Nuclear Engineering Division, Martin-Marietta Company, Baltimore, Md. His initial assignment concerns the design of process-instrumentation systems for isotope production facilities and reactor systems.

• The Consultants Engineering Science Division of the Flow Corporation, Fort Belvoir, Va., utilizes one of our graduates to assist in its studies of radiation hazards. And three others are presently pursuing additional advanced technical study.

Drafting and Refining the Program

When the possibility of introducing a program in the nuclear field was first being considered, it was decided at the outset to combine the nuclear courses with a strong base in electronics because of the interrelationship of the two fields. A proposed curriculum was drawn up and it received favorable comment and suggestions for improvement from industry.

The curriculum was further evaluated in terms of the criteria established by the American Nuclear Society and the American Society for Engineering Education, and subsequently took its present shape (see accompanying tabular depiction).

Completion of this curriculum requires 92 semester credits, which are divided into the following general areas:

	Semester credits
English and technical writing	9
Social studies	9
Mathematics	14
Physics	8
Electrical and electronics	21
Nuclear	16
Other technical courses	13
Physical education	2
Total	92

Supporting Procedures, Considerations

The preparation of a grant proposal for the Atomic Energy Commission involved setting forth proposed course outlines, experiments, lists of equipment (including prices), projected student enrolments, faculty qualifications, and other pertinent information. (A very helpful *Guide for Submission of Proposals for Equipment Grants and Loan of Materials in Physical Sciences and Engineering* is now available from the Atomic Energy Commission.)

The granting of the various special licenses is predicated on the petitioning institution having the required qualified personnel and laboratory facilities. The license forms are relatively simple and selfexplanatory, and are also available from the AEC.

Because of the rigorous courses required in the nuclear program, as indeed is the case throughout its engineering-technology programs, the Old Dominion Community College Division's Technical Institute accepts only those secondary-school graduates who have successfully passed courses in elementary algebra, intermediate algebra, plane geometry, and chemistry. The Technical Institute is accredited by the Southern Association of Colleges and Schools and is an affiliate member of the American Society for Engineering Education.

Laboratory Work, Equipment

The experimental work in the nuclear courses includes determination of Geiger tube characteristics, decontamination procedures, proportional counter operation, half-life determinations, calibration of protective equipment, range, scattering, and absorption of alpha and

(Please turn to page 75.)

Program Outline
Nuclear Option, Electronic-Engineering Technology

Semester				*C	L	S
1	Engl	101	Composition and literature	3	0	3
	Fine Arts		Elective	3	0	3
	Math	112	Topics in algebra	3	0	3
	Tech	100	Introduction to technology	0	2	1
	Tech	151	Electrical circuits	3	6	5
	P.E.	101	Physical education	0	3	1
				12	11	16
2	Engl	102	Composition and literature	3	0	3
	Math	113	Topics in trigonometry	3	0	3
	Phys	101	Elementary physics	3	3	4
	Tech	251	Electronics I	3	6	5
	P.E.	102	Physical education	0	3	1
				12	12	16
3	Phys	102	Elementary physics	3	3	4
	Tech	105	Analytic geometry and calculus	5	0	5
	Tech	252	Electronics II	3	6	5
				11	9	14
4	Engl	103	Technical writing	3	0	3
	Tech	106	Electronics calculus	3	0	3
	Tech	164	Graphics	1	6	3
	Tech	253	Pulse and digital circuits	2	3	3
	Tech	257	Servomechanisms	2	3	3
				11	12	15
5	Hist	111	Technology in history	3	0	3
	Tech	202	Industrial materials	2	3	3
	Tech	289	Power plants	2	3	3
	Tech	291	Nucleonics	3	3	4
	Tech	292	Environmental radiation	3	0	3
				13	9	16
6	Social Studies		Elective	3	0	3
	Tech	391	Radioisotope procedures	1	3	2
	Tech	392	Nuclear instrumentation	3	3	4
	Tech	393	Reactor technology	2	3	3
	Technical		Elective	2	3	3
				11	12	15

*C=Class hours; L=Laboratory hours; S=Semester credit hours.

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beta particles, gamma absorption coefficients, energy range changes, spectrum plotting, radioisotope tracing, analysis of decay, neutron detection, counting, absorption, and scattering, radioisotope preparation by neutron bombardment, statistical errors in radiation detection, and others.

As pointedly evidenced by several of the accompanying photographs, safety precautions are stressed throughout the program. This emphasis virtually encompasses a technology of its own, by reason of the supporting instrumentation and related instruction.

The laboratory equipment is valued at $35,000 and includes the following:

- Energy analyzer training systems for use with either Geiger tubes or scintillation detectors.
- 400-Channel Analyzer System, including detector and teletypewriter readout.
- Ratemeter training systems.
- Gas flow detectors.
- Beta-gamma survey meters.
- Neutron survey meters.
- Neutron howitzer with 2-curie Pu-Be neutron source.
- Cobalt-60 source (10 millicuries).
- Various small sources.
- Nuclear fume hood for radioisotope preparation.
- Assorted sample changers, dosimeters, x-y recorders, etc.
- Assorted chemical laboratory apparatus for nuclear work.

Future Directions, General Prognosis

There are several signposts pointing to a rapid buildup in the demand and need for nuclear technicians of the type being trained at Old Dominion.

For example, with the cost of producing electricity by means of nuclear power plants approaching that of fossil fuel plants, the Atomic Energy Commission has asked Congress for permission to sell atomic fuel instead of leasing or renting it. In fact, when President Johnson told a college audience not too long ago that an "economic breakthrough" had been achieved in nuclear power, he thereby signalled the start of a race to produce sufficient nuclear engineers and technicians to meet the rapidly growing needs of both industry and the armed forces.

At Old Dominion, we feel we are in the vanguard of an inevitable move by technical institutes to bring adequate resources to bear on the preparation of youth for participation in the Nuclear Age.

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